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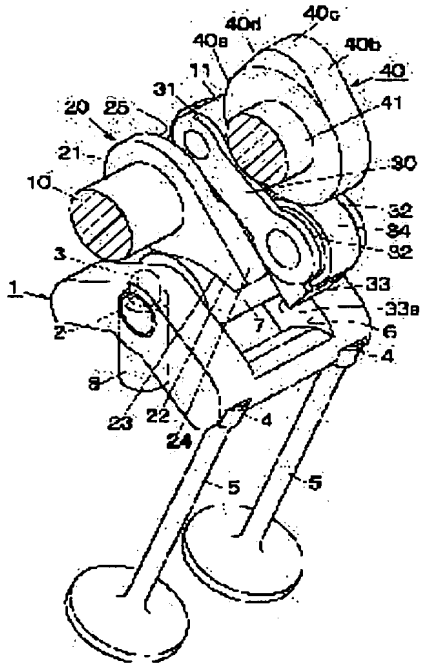
(54) VARIABLE VALVE MECHANISM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a variable valve mechanism capable of continuously or stepwisely changing lift amount of a valve, an operation angle and lift timing of the valve by rotating one camshaft without remarkably changing a conventional driving system.
SOLUTION: This mechanism is provided with a lift control device for changing an oscillation starting angle of a first interposing arm 20 and changing lift amount and the operation angle of the valve 5 by a rotating cam 40 by journaling a control shaft 10 in the vicinity of a rocker arm 1, attaching the first interposing arm 20 to the control shaft 10, providing the control shaft 10 with a projecting part 11, attaching a second interposing arm 30 to the projecting part 11, journaling the camshaft 41 forming the rotating cam 40, and rotating the control shaft 10 and the projecting part 11 at small angles.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] A control shaft is supported to revolve pivotable whenever [corniculus] near the rocker arm. The first inclusion arm which equipped said control shaft with the press side which presses the cam corresponding point of a rocker arm is independently fixed to revolve rockable with a revolution whenever [corniculus / of this control shaft]. The lobe which projects in radial [of this control shaft] and rotates whenever [corniculus] with this control shaft to said control shaft is prepared. The tip of said lobe is equipped with the cam slide contact section and the press section which presses said first inclusion arm. The distance of this cam slide contact section and the press section fixes to revolve the second inclusion arm which changes in the die-length direction of the second inclusion arm rockable. One cam shaft in which the rotating cam to which the lift of the bulb is carried out by pressing a rocker arm through the second inclusion arm and the first inclusion arm in the order by pressing said cam slide contact section was formed is supported to revolve pivotable. The splash initiation angle of the first inclusion arm is changed through making the variation rate of the second inclusion arm carry out in the die-length direction by rotating said control shaft and lobe whenever [corniculus] in less than one revolution continuously or gradually according to an internal combustion engine's operation situation. The adjustable valve gear which formed the lift control unit to which the amount of lifts and working angle of a bulb by said rotating cam are changed by having and changing the contact location of the press side of the first inclusion arm to a cam corresponding point in the die-length direction of the first inclusion arm.
[Claim 2] Any one is an adjustable valve gear according to claim 1 which is the roller with which said cam corresponding point, the cam slide contact section, or the press section was fixed to revolve by said rocker arm pivotable at least, the roller fixed to revolve by said second inclusion arm pivotable, or the rotation member fixed to revolve by the second inclusion arm rotatable.
[Claim 3] The adjustable valve gear according to claim 1 or 2 by which at least one or more lobes were prepared in said control shaft.

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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the adjustable valve gear to which the amount of lifts and working angle of a bulb are changed continuously or gradually according to an internal combustion engine's operation situation.
[0002]
[Description of the Prior Art] In order to reconcile many properties, such as an air cleanliness class of an internal combustion engine's output, torque, fuel consumption, and exhaust gas, the adjustable valve gear to which the amount of lifts or working angle of a bulb is changed continuously or gradually according to an internal combustion engine's operation situation is considered variously. While rotating two cam shafts as the one example of representation and making a rocker arm rock, by changing the phase of two cam shafts relatively, the splash angle of a rocker arm is changed and the thing to which it was made to change continuously the amount of lifts or working angle of a bulb is known.
[0003]
[Problem(s) to be Solved by the Invention] However, in order to have rotated two cam shafts like the above-mentioned example of representation, while the conventional drive system which has rotated one cam shaft would be changed a lot, there was a problem of being difficult on actuation.
[0004] Then, without solving the above-mentioned technical problem and changing the conventional drive system a lot, the object of this invention rotates one cam shaft, and is to offer the adjustable valve gear to which the amount of lifts of a bulb, a working angle, and the lift timing of a bulb can be changed continuously or gradually.
[0005]
[Means for Solving the Problem] In order to attain the above-mentioned object, the adjustable valve gear of this invention A control shaft is supported to revolve pivotable whenever [corniculus] near the rocker arm. The first inclusion arm which equipped the control shaft with the press side which presses the cam corresponding point of a rocker arm is independently fixed to revolve rockable with a revolution whenever [corniculus / of this control shaft]. The lobe which projects in radial [of this control shaft] and rotates whenever [corniculus] with this control shaft to a control shaft is prepared. The tip of a lobe is equipped with the cam slide contact section and the press section which presses the first inclusion arm. The distance of this cam slide contact section and the press section fixes to revolve the second inclusion arm which changes in the die-length direction of the second inclusion arm rockable. One cam shaft in which the rotating cam to which the lift of the bulb is carried out by pressing a rocker arm through the second inclusion arm and the first inclusion arm in the order by pressing the cam slide contact section was formed is supported to revolve pivotable. The splash initiation angle of the first inclusion arm is changed through making the variation rate of the second inclusion arm carry out in the die-length direction by rotating a control shaft and a lobe whenever [corniculus] in less than one revolution continuously or gradually according to an internal combustion engine's operation situation. It is characterized by forming the lift control unit to which the amount of lifts and working angle of a bulb by the rotating cam are changed by having and changing the contact location of the press side of the first inclusion arm to a cam corresponding point in the die-length direction of the first inclusion arm. In addition, a cam corresponding point is the semantics of the part which corresponds to a rotating cam through the second inclusion arm and the first inclusion arm, and is pressed. Moreover, as for a revolution, angle of rotation says the revolution to which it does not amount to 360 degrees whenever [corniculus].
[0006] A roller also with the fixed pivotable hard chip or a rotatable rotation member is sufficient as a cam

corresponding point, the cam slide contact section, or the press section. However, when a sliding friction and wear are taken into consideration, any one (preferably yes, a gap or two most preferably wholly) has the desirable rotation member fixed to revolve rotatable by the roller or the second inclusion arm fixed to revolve pivotable by the roller or the second inclusion arm with which a cam corresponding point, the cam slide contact section, or the press section was fixed to revolve pivotable [to a rocker arm] at least.

[0007] That in which at least one or more lobes which fix the second inclusion arm to revolve were prepared as a control shaft can be illustrated. The thing which specifically pierces through opening installed through the upper part of the first inclusion arm and by which one or two lobes were prepared in the control shaft, and the thing by which one lobe was formed in the end outside in the die-length direction of the control shaft of the first inclusion arm at a time on one or the ends outside can be illustrated.

[0008] When preparing a roller and a rotation member on the same axle, it can twist on the second inclusion arm by making the point of the second inclusion arm, and the upper part of a rotation member into the shape of a fork, pinching a roller with the fork of a rotation member, and pinching them with the fork of the second inclusion arm point further, and you may make it stress not make it generated. Moreover, a roller may be pinched with the fork of the point of the second inclusion arm, and they may be made to pinch with the fork of the upper part of a rotation member. In this case, it is desirable to make it make the underside of a rotation member always contact the first inclusion arm by forming the underside of a rotation member and the contact side of the rotation member of the first inclusion arm in common so that a rotation member may rotate and a cam may not be contacted.

[0009] Although a rocker arm, the first inclusion arm, and the second inclusion arm may be rocked in another field, it is desirable to rock on space efficiency and in the same field.

[0010] Here, which the following type is sufficient as a rocker arm.

(1) The type which has the center-of-oscillation section in the end section of a rocker arm, has a cam corresponding point in a center section, and has the bulb press section in an other end edge. (The so-called swing arm)

(2) The type which has the center-of-oscillation section in the center section of the rocker arm, has a cam corresponding point in the end section, and has the bulb press section in an other end edge.

[0011] The two following modes can be illustrated as the center-of-oscillation section.

(a) The center-of-oscillation section is a mode which is the concave spherical-surface section supported by the pivot.

(b) The center-of-oscillation section is a mode which is the axial hole section with which the seesaw arm was supported to revolve rotatable.

[0012] In the mode of the above (a), it is desirable that a tappet-clearance adjustment device is prepared in the center-of-oscillation section. For example, the tappet-clearance adjustment device thrust into the female screw which formed the male screw formed in the pivot in pivot supporting material possible [the amount accommodation of screwing] can be illustrated.

[0013] Especially as a lift control unit, although not limited, the thing equipped with a helical spline device, the actuator using oil pressure, and control units, such as a microcomputer, can be illustrated.

[0014] In addition, although the adjustable valve gear of this invention is also applicable to either an intake valve or an exhaust air bulb, applying to both is desirable.

[0015]

[Embodiment of the Invention] Hereafter, the example of an operation gestalt of the adjustable valve gear which carried out this invention is explained with reference to drawing 1 - drawing 5 . The swing-arm type rocker arm 1 is used for this adjustable valve gear, and the end section of a rocker arm 1 is the center-of-oscillation section in which the pivot 3 comes to support the concave spherical-surface section 2 formed in the said division. the other end of a rocker arm 1 -- two forks -- it is divided into a **, the bulb press section 4 is cut in each head lower part, and the bulb press section 4 presses the end face section of a bulb 5.

[0016] On the roller arrangement hole 6 formed in the center section of the rocker arm 1, the first roller 7 as a cam corresponding point is arranged so that it may project a little from the top face of a rocker arm 1, and this first roller 7 is fixed to revolve pivotable around the shaft which intersects perpendicularly with an arm side attachment wall.

[0017] The male screw formed in the axial lower part of the pivot 3 is thrust into the female screw formed in the pivot supporting material 8 possible [the amount accommodation of screwing], and the tappet-clearance adjustment device is constituted.

[0018] Near the upper part of the first roller 7, the approximate circle column-like control shaft 10 is supported to revolve pivotable whenever [cornículus].

[0019] The first inclusion arm 20 which equipped the control shaft 10 with the press side 23 which presses the first roller 7 is independently fixed to revolve rockable with the revolution whenever [corniculus / of a control shaft]. The first inclusion arm 20 is equipped with the approximately cylindrical body 21 which a control shaft 10 inserts in, and the arm section 22 prolonged toward the bulb press section 4 side as used in the field of a rocker arm 1 from a body 21. Moreover, the first inclusion arm 20 is energized in the direction in which the arm section 22 goes up by the member which is not illustrated.
[0020] The underside of the arm section 22 is the press side 23 for pressing the first roller 7, and it is formed in the concave bend side of larger radius of curvature than the radius of the first roller 7, and even if the contact location of the press side 23 over the first roller 7 changes in the die-length direction of the first inclusion arm 20 so that it may mention later, the press side 23 presses the first roller 7 in the direction of an abbreviation perpendicular. The flat-surface section 24 prolonged in a tangential direction from a body 21 is formed in the upper part of the press side 23.
[0021] The opening 25 prolonged in a circumferencial direction from near the boundary of the flat-surface section 24 and a body 21 to near the opposite hand of a control shaft 10 is installed through the top face of the body 21 of the first inclusion arm 20.
[0022] The lobe 11 which projects in a control shaft 10 radial [of a control shaft 10], and rotates whenever [corniculus] with a control shaft 10 is formed. A lobe 11 pierces through the opening 25 of the first inclusion arm 20, the lobe 11 is engaging with opening 25, and the first inclusion arm 20 is rockable to the lobe 11 and the control shaft 10 within limits permitted.
[0023] The second inclusion arm 30 which equipped the tip of a lobe 11 with the second roller 34 as the cam slide contact section and the rotation member 33 as the press section which presses the first inclusion arm 20 is fixed to revolve rockable, where the tip of a lobe 11 is pinched by the fork piece 31 formed in the end face section of the second inclusion arm 30.
[0024] it allots on the same axle which intersects perpendicularly with the paries medialis orbitae of the fork piece 32 which the second roller 34 and the rotation member 33 formed in the abbreviation trapezoid are in the condition which the second roller 34 was made to project a little to the paries medialis orbitae of the fork formed in the upper bed of the rotation member 33, and pinched it to it, and was formed at the head of the second inclusion arm 30 -- having -- the surroundings of the shaft -- a revolution -- or it is fixed to revolve rotatable. The second roller 34 and the rotation member 33 of each other can be independently rotated or rotated now.
[0025] An even field is formed in a soffit and the rotation member 33 has become sliding section 33a which can slide in contact with the flat-surface section 24 of the first inclusion arm 20. Since the first inclusion arm 20 is always energized in the direction in which the arm section 22 goes up as above-mentioned, the rotation member 33 always contacts the flat-surface section 24 in sliding section 33a. Moreover, the upper bed side of the rotation member 33 is formed so that the second roller 34 may be made to project to whenever [wide angle] so that the second roller 34 may function as the cam slide contact section. Therefore, the distance of the second roller 34 and sliding section 33a of the rotation member 33 changes in the die-length direction of the second inclusion arm 30, and serves as max in the center position of the second roller.
[0026] The cam shaft 41 in which the rotating cam 40 to which the lift of the bulb 5 is carried out was formed is supported to revolve with pressing a rocker arm 1 through the second inclusion arm 30 and the first inclusion arm 20 in the order by pressing the second roller 34 pivotable by the head upper part of the second inclusion arm 30. the nose to which base circle 40a and the amount of projection increase a rotating cam 40 gradually -- gradual increase section 40b and the nose used as the amount of the maximum projection -- 40c and the nose which the amount of projection dwindles -- it consists of 40d of the gradual decrease sections.
[0027] a control shaft 10 and a lobe 11 -- the range of less than one revolution -- an internal combustion engine's operation situation -- responding -- continuous -- or -- being gradual (preferably three or more steps, still more preferably four or more steps of multistage stories) -- the lift control unit (graphic display abbreviation) rotated whenever [corniculus] is connected to the control shaft 10. If a control shaft 10 and a lobe 11 are rotated whenever [corniculus] with a lift control unit, the second inclusion arm 30 will displace in the die-length direction. The second roller 34 and the rotation member 33 of the second inclusion arm 30 change the distance of a rotating cam 40 and the first inclusion arm 20 then, changing a contact location with a rotating cam 40 or the first inclusion arm 20, respectively. Thereby, the first inclusion arm 20 changes the amount of lifts and working angle of a bulb 5 by said rotating cam 40 by being able to change a splash initiation angle now and changing the contact location of the press side 23 of the first inclusion arm 20 to the first roller 7 in the die-length direction of the first inclusion arm 20.

[0028] While the piston which prepared for example, the helical spline is accompanied by the revolution of a predetermined angle with oil pressure, it moves to shaft orientations, and this revolution has the structure of changing the standing-up include angle of a lobe 11 in less than one revolution by rotating a control shaft 10 whenever [cornículus], and a lift control unit is controlled by control units, such as a microcomputer, based on the detection value from an internal combustion engine's revolution sensor, an accelerator opening sensor, etc.

[0029] By the above-mentioned configuration, the adjustable valve gear of this operation gestalt If a rotating cam 40 presses the second roller 34, the second inclusion arm 30 will rock focusing on the fixing-with-a-spindle section with a lobe 11. The first inclusion arm 20 rocks by pressing the first inclusion arm 20, while the rotation member 33 changes the contact location of sliding section 33a and the flat-surface section 24. While the first inclusion arm 20 changes a contact location with the first roller 7, a rocker arm 1 rocks by pressing the first roller 7 in respect of [23] press, and a bulb 5 carries out a lift.

[0030] Moreover, at this time, by rotating a control shaft 10 whenever [cornículus], the second inclusion arm 30 acts so that a rotating cam 40 and the first inclusion arm 20 may be kept away by the second roller 34 and the rotation member 33. At this time, the first inclusion arm 20 can rock in the direction which drops the arm section 22, and can change now the splash initiation angle of the first inclusion arm 20. The contact location of the first inclusion arm 20 to the first roller 7 changes in the die-length direction of the first inclusion arm 20. Then, specifically When the splash initiation angle of the first inclusion arm 20 is high, the contact location of the first roller 7 becomes the end face side of a body 21 or the arm section 22, and when the splash initiation angle of the first inclusion arm 20 is low, the contact location of the first roller 7 becomes the head side of the arm section 22.

[0031] The adjustable valve gear constituted as mentioned above acts as follows. First, drawing 3 (a) -> (b) shows the operation by the location of a lobe 11 and it under the operation situation which needs the amount of the maximum lifts, and the maximum working angle. To be shown in drawing 3 (a), it is controlled by the bottom of the operation situation which needs the amount of the maximum lifts, and the maximum working angle so that the second roller 34 and the rotation member 33 will be in the maximum ****** rare ****** between a rotating cam 40 and the first inclusion arm 20. Therefore, the splash initiation angle of the first inclusion arm 20 when the second roller 34 is in slide contact with base circle 40a of a rotating cam 40 is the lowest. At this time, since it is in contact with the body 21 of the first inclusion arm 20 and the first roller 7 is in the best location, the first roller 7 has not carried out the lift of the bulb 5. However, since the contact location of the first roller 7 is a location near the press side 23, if the first inclusion arm 20 begins to rock, it is in the condition that the contact location of the first roller 7 shifts to the press side 23 promptly, a rocker arm 1 is pushed, and a bulb 5 carries out a lift. it is shown in drawing 3 (b) -- as -- the second roller 34 -- a nose -- pass gradual increase section 40b -- a nose, if pressed [come] by 40c Since the rotation member 33 presses the first inclusion arm 20 where the flat-surface section 24 of the first inclusion arm 20 is always contacted in sliding section 33a The rotation member 33 presses the first inclusion arm 20, rotating to the second inclusion arm 30, also rocks the second inclusion arm 30 then focusing on the fixing-with-a-spindle section of the upper bed of a lobe 11, and permits the down variation rate of the second roller 34. At this time, the first inclusion arm 20 carries out the maximum splash, the contact location of the first inclusion arm 20 to the first roller 7 shifts at the head of the press side 23 from a body 21, a rocker arm 1 is rocked in the maximum depression location, the amount L of lifts of a bulb 5 occurs and increases, and reaches Maximum Lmax, and a working angle also serves as max. In addition, even if said contact location changes as aforementioned, since the press side 23 formed in the concave bend side presses the first roller 7 in the direction of an abbreviation perpendicular, the stress component of the die-length direction hardly arises on the first inclusion arm 20, and a burden is not placed on between a body 21 and a control shaft 10 by it.

[0032] Next, drawing 4 (a) -> (b) shows the operation by the location of a lobe 11 and it under the operation situation which needs the amount of minute lifts, and a minute working angle. To be shown in drawing 4 (a), it is controlled by the bottom of the operation situation which needs the amount of minute lifts, and a minute working angle so that the second roller 34 and the rotation member 33 will be greatly estranged from between a rotating cam 40 and the first inclusion arms 20. Therefore, the splash initiation angle of the first inclusion arm 20 when the second roller 34 is in slide contact with base circle 40a of a rotating cam 40 has become near the best location. At this time, since it is in contact with the body 21 of the first inclusion arm 20 and the first roller 7 is in the best location, the first roller 7 has not carried out the lift of the bulb 5. it is shown in drawing 4 (b) -- as -- the second roller 34 -- a nose -- pass gradual increase section 40b -- a nose -- since the second roller 34 is greatly separated from the control shaft 10 and the cam shaft 41 when pressed [come] by 40c, the amount of press to the first inclusion arm 20 becomes small compared with drawing 3

(b), and the amount of splashes of the first inclusion arm 20 also becomes small. Since it remains in extent in which the contact location of the first inclusion arm 20 to the first roller 7 shifts to the press side 23 more slightly than a body 21 at this time, the amount of depressions of the first roller 7 becomes minute, and becomes minute [both the amounts L of lifts and working angles of a bulb 5] (refer to drawing 6).
[0033] In addition, under the operation situation which needs in-between amount of lifts and working angle of drawing 3 and drawing 4 , as the include angle of the in-between protrusion section 11 of drawing 3 and drawing 4 is shown in drawing 6 by making continuously or gradually with a lift control unit, in-between amount of lifts and working angle are obtained continuously or gradually.
[0034] Next, drawing 5 (a) -> (b) shows the operation by the location of the protrusion section 11 and it under the operation situation which needs a lift pause. To be shown in drawing 5 (a), it projects so that the maximum alienation may be carried out the second roller 34 and the rotation member 33 from between a rotating cam 40 and the first inclusion arms 20, and the standing-up include angle of the section 11 is controlled by the bottom of the operation situation which needs a lift pause. Therefore, the splash initiation angle of the first inclusion arm 20 when the second roller 34 is in slide contact with base circle 40a of a rotating cam 40 is the best location. At this time, since it is in contact with the body 21 of the first inclusion arm 20 and the first roller 7 is in the best location, the first roller 7 has not carried out the lift of the bulb 5. it is shown in drawing 5 (b) -- as -- the second roller 34 -- a nose -- pass gradual increase section 40b -- a nose -- when pressed [come] by 40c, for the maximum detached building ****** reason from a control shaft 10 and a cam shaft 41, even if the amount of press to the first inclusion arm 20 compares with drawing 4 (b), it becomes still smaller, and, also in the amount of splashes of the first inclusion arm 20, the second roller 34 becomes minute. Although the contact location of the first inclusion arm 20 to the first roller 7 moves in the direction of the press side 23 from a body 21 at this time, since it remains on a body 21, the amount of depressions of the first roller 7 will be set to 0, and a bulb 5 will be in lift hibernation.
[0035] Next, only a part which is different from the first operation gestalt with reference to drawing 7 about the example of the second operation gestalt of the adjustable valve gear which carried out this invention is explained. Drawing 7 forms the lobe 11 which does not pierce through the first inclusion arm 20 in a control shaft 10 to the adjustable valve gear of the first operation gestalt.
[0036] Although one lobe 11 pierced through the opening 25 formed in the first inclusion arm 20 and was prepared in the control shaft 10 with the first operation gestalt, the lobe 11 is formed in every one both-sides side of the first inclusion arm 20 with this operation gestalt. Since the die length of a lobe 11 is shortened in order to summarize the whole device small, the contact to the first inclusion arm 20 of the end face section of the second inclusion arm 30 is missed and missed, and the field 26 is formed in the first inclusion arm 20.

[0037] Moreover, although the lobe 11 was pinched with the first operation gestalt by the fork piece 31 formed in the end face section of the second inclusion arm, since two lobes 11 prepared in the control shaft 10 with this operation gestalt pinch the second inclusion arm 30, it becomes unnecessary to form the end face section of the second inclusion arm 30 in the shape of a fork, and it is ******** 35.
[0038] With the first operation gestalt, since the lobe 11 engaged with opening 25, the lobe 11 regulated the rockable range of the first inclusion arm 20, but with this operation gestalt, since the first inclusion arm 20 does not receive regulation of the rockable range by the lobe 11, a device design becomes easy to carry out it.
[0039] Next, only a part which is different from the second operation gestalt with reference to drawing 8 about the example of the third operation gestalt of the adjustable valve gear which carried out this invention is explained. Drawing 8 removes the second roller 34 from the adjustable valve gear of the second operation gestalt.
[0040] Although it was fixed to revolve with the second operation gestalt so that the second roller 34 as the cam slide contact section might project in the point of the second inclusion arm 30, the cam slide contact side 36 where the second inclusion arm 30 of this operation gestalt receives press in the fork piece 32 upside by the rotating cam 40 is formed. The cam slide contact side 36 is formed so that it may separate from the second inclusion arm 30, as it approaches at a head from the end face of the second inclusion arm 30.
[0041] Components mark can be reduced by the second roller 34 having been excluded. It becomes unnecessary moreover, for the rotation member 33 to form the fork for pinching the second roller 34 in the upper bed.
[0042] In addition, this invention is not limited to the configuration of said operation gestalt, and can also be changed and materialized in the range which does not deviate from the meaning of invention as follows.
(1) Change the method of the configuration of a lift control unit, or control suitably.

(2) Consider as the rocker arm which has the center-of-oscillation section in a center section.
(3) Let the press section be a pivotable roller.
(4) Prepare the press section and the cam slide contact section on a respectively different shaft.
(5) Put side by side the press section and the cam slide contact section on the same axle.
[0043]
[Effect of the Invention] Without changing the conventional drive system a lot, since it is constituted as above-mentioned, the adjustable valve gear of this invention rotates one cam shaft, and does so the outstanding effectiveness that the amount of lifts and working angle of a bulb can be changed continuously or gradually.

[Translation done.]

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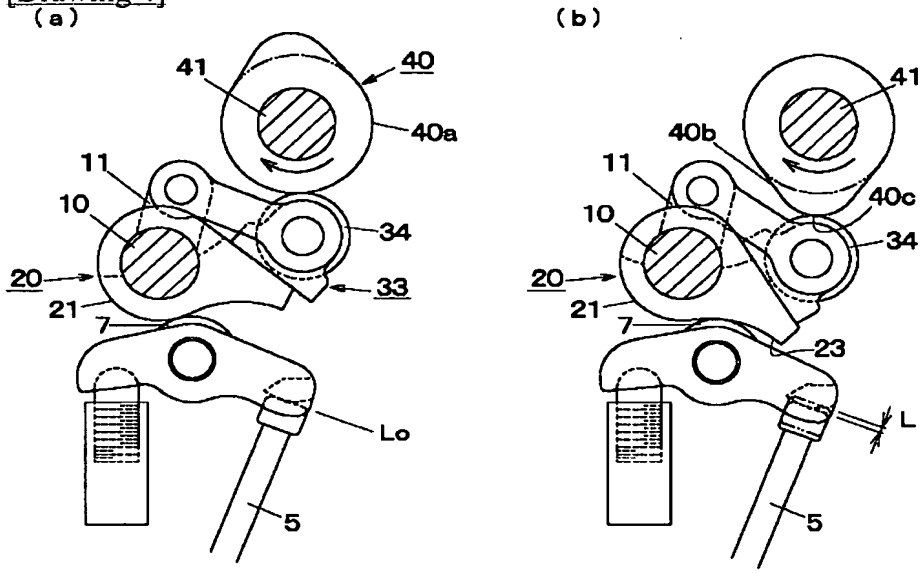
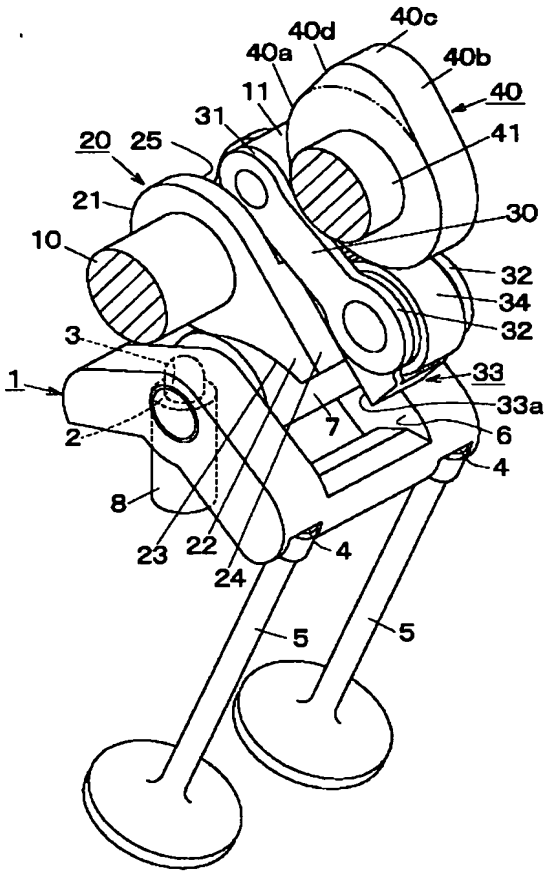
DRAWINGS

[Drawing 4]



[Drawing 1]



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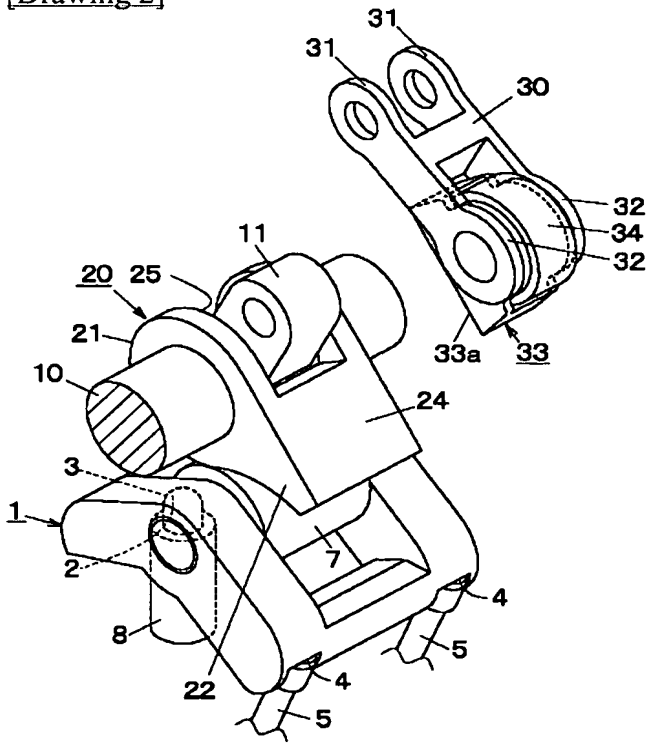

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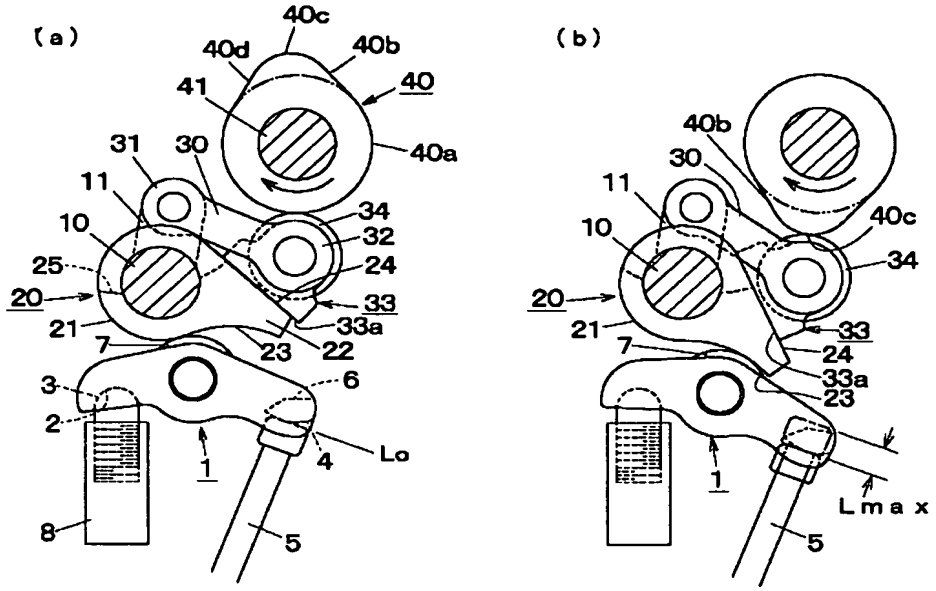

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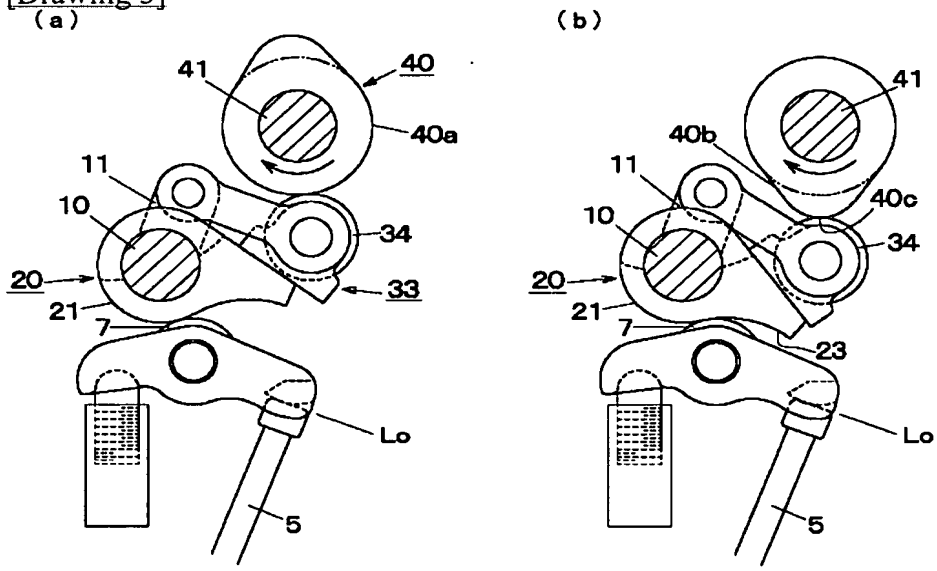

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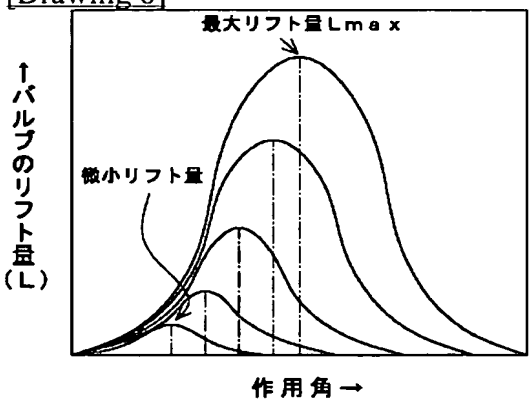
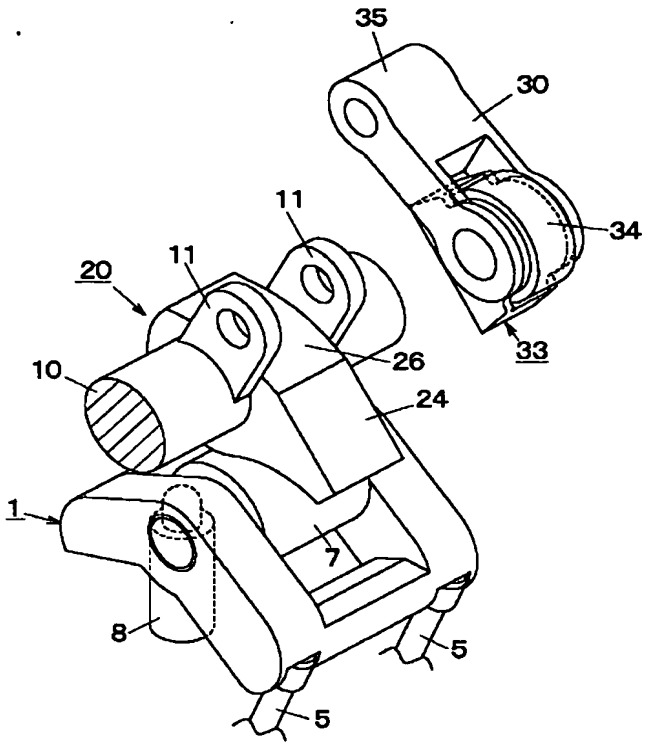


[Drawing 7]



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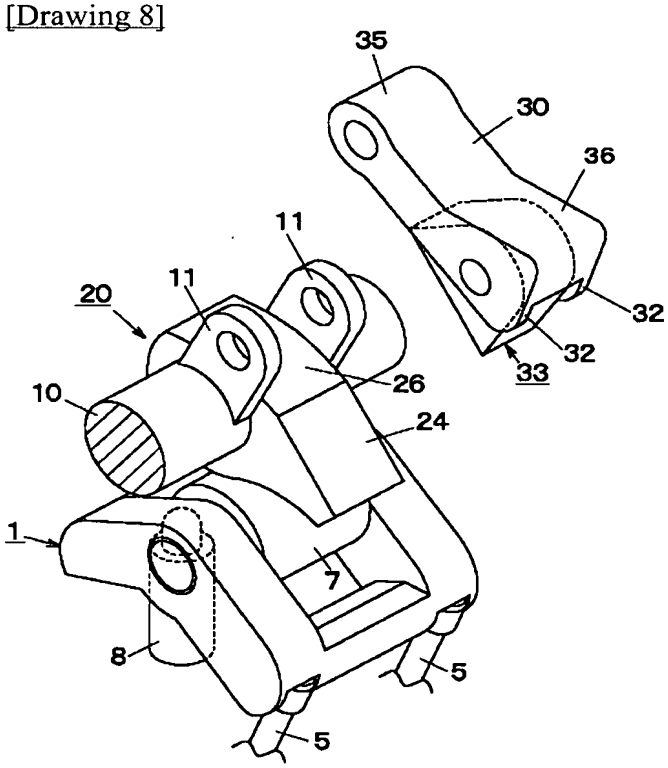

[Translation done.]

CORRECTION OR AMENDMENT

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[Publication date] October 6, Heisei 17 (2005. 10.6)

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[Procedure amendment]
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[Procedure amendment 1]
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[Item(s) to be Amended] 0033
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[0033]
In addition, under the operation situation which needs in-between amount of lifts and working angle of drawing 3 and drawing 4, as the include angle of the in-between lobe 11 of drawing 3 and drawing 4 is shown in drawing 6 by making continuously or gradually with a lift control unit, in-between amount of lifts and working angle are obtained continuously or gradually.
[Procedure amendment 2]
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[0034]
Next, drawing 5 (a) -> (b) shows the operation by the location of a lobe 11 and it under the operation situation which needs a lift pause.
To be shown in drawing 5 (a), it projects so that the maximum alienation may be carried out the second roller 34 and the rotation member 33 from between a rotating cam 40 and the first inclusion arms 20, and the standing-up include angle of the section 11 is controlled by the bottom of the operation situation which needs a lift pause. Therefore, the splash initiation angle of the first inclusion arm 20 when the second roller 34 is in slide contact with base circle 40a of a rotating cam 40 is the best location. At this time, since it is in contact with the body 21 of the first inclusion arm 20 and the first roller 7 is in the best location, the first roller 7 has not carried out the lift of the bulb 5.
it is shown in drawing 5 (b) -- as -- the second roller 34 -- a nose -- pass gradual increase section 40b -- a nose -- when pressed [come] by 40c, for the maximum detached building ****** reason from a control shaft 10 and a cam shaft 41, even if the amount of press to the first inclusion arm 20 compares with drawing

4 (b), it becomes still smaller, and, also in the amount of splashes of the first inclusion arm 20, the second roller 34 becomes minute. Although the contact location of the first inclusion arm 20 to the first roller 7 moves in the direction of the press side 23 from a body 21 at this time, since it remains on a body 21, the amount of depressions of the first roller 7 will be set to 0, and a bulb 5 will be in lift hibernation.

[Translation done.]